WHAT IS CLAIMED IS:

1. A polymer matrix material comprising:

a polymerization product of one or more monomers selected from the group of water-soluble, ethylenically-unsaturated acids and acid derivatives; and

a crosslinking agent,

wherein a quantity of water is used for polymerization, the quantity being selected to swell the polymer material to a defined volume upon curing.

2. The polymer matrix material as in claim 1, further comprising a water-soluble or water-swellable polymer.

3. The polymer matrix material as in claim 1, further comprising a chemical polymerization initiator.

4. The polymer matrix material as in claim 1, further comprising:

a water-soluble or water-swellable polymer; and

a chemical polymerization initiator.

5. The polymer matrix material as in claim 1, further comprising a neutralizing agent.

6. The polymer matrix material as in claim 1, wherein the water is replaced with a solution of a desired species.

7. The polymer matrix material as in claim 6, further wherein the volume of the polymer matrix material after species replacement deviates from the volume of the polymer matrix material before species replacement by less than about 50%.

8. The polymer matrix material as in claim 6, further wherein the volume of the polymer matrix material after species replacement deviates from the volume of the polymer matrix material before species replacement by less than about 20%.

9. The polymer matrix material as in claim 6, further wherein the volume of the polymer matrix material after species replacement deviates from the volume of the polymer matrix material before species replacement by less than about 5%.

10. The polymer matrix material as in claim 6, wherein the species is selected form the group consisting of anion conducting species, cation conducting species, neutral species, electrochromic species, and combinations comprising at least one of the foregoing species.

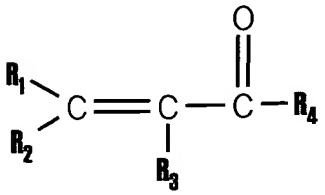
11. The polymer matrix material as in claim 1, wherein water comprises about 50% to about 90%, on a weight basis, of the polymer matrix material.

12. The polymer matrix material as in claim 1, wherein water comprises about 60% to about 80%, on a weight basis, of the polymer matrix material.

13. The polymer matrix material as in claim 1, wherein water comprises about 62% to

about 75%, on a weight basis, of the polymer matrix material.

14. The polymer matrix material as in claim 1, wherein the water soluble ethylenically unsaturated acids and acid derivatives have the general formula:



wherein R1, R2, and R3 are independently selected from the group consisting of H, C, C2-C6 alkanes, C2-C6 alkenes, C2-C6 alkynes, aromatics, halogens, carboxylic acid derivatives, sulfates and nitrates; and

R4 is selected from the group consisting of NR5, NHR5, NH2, OH, H, halides, OR5, and carboxylic acid derivatives, wherein R5 is selected from the group consisting of H, C, C2-C6 alkanes, C2-C6 alkenes, C2-C6 alkynes, and aromatics.

15. The polymer matrix material as in claim 1, wherein the water soluble ethylenically unsaturated acids and acid derivatives are selected from the group consisting of methylenebisacrylamide, acrylamide, methacrylic acid, acrylic acid, fumaramide, fumaric acid, N-isopropylacrylamide, N, N-dimethylacrylamide, 3,3-dimethylacrylic acid, maleic anhydride, and combinations comprising at least one of the foregoing ethylenically unsaturated acids and derivatives.

16. The polymer matrix material as in claim 1, wherein the water soluble ethylenically unsaturated acids and acid derivatives are selected from the group consisting of 1-vinyl-2-

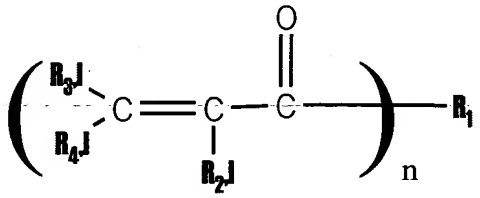
pyrrolidinone, the sodium salt of vinylsulfonic acid, and combinations comprising at least one of the foregoing ethylenically unsaturated acids and derivatives.

17. The polymer matrix material as in claim 1, wherein the ethylenically unsaturated acids or acid derivatives comprises about 5% to about 50%, by weight, of the total monomer solution prior to polymerization.

18. The polymer matrix material as in claim 1, wherein the ethylenically unsaturated acids or acid derivatives comprises about 7% to about 25%, by weight, of the total monomer solution prior to polymerization.

19. The polymer matrix material as in claim 1, wherein the ethylenically unsaturated acids or acid derivatives comprises about 10% to about 20%, by weight, of the total monomer solution prior to polymerization.

20. The polymer matrix material as in claim 1, wherein the crosslinking agent is of the general formula:



wherein i=1 n, and n≥2;

R2,i, R3,i, and R4,i are independently selected from the group consisting of H, C, C2-C6

alkanes, C2-C6 alkenes, C2-C6 alkynes, aromatics, halogens, carboxylic acid derivatives, sulfates and nitrates;

R1 is selected from the group consisting of N, NR5, NH, O, and carboxylic-acid derivatives, wherein R5 is selected from the group consisting of H, C, C2-C6 alkanes, C2-C6 alkenes, C2-C6 alkynes, and aromatics.

21. The polymer matrix material as in claim 1, wherein the crosslinking agent is selected from the group consisting of methylenebisacrylamide, ethylenebisacrylamide, any water-soluble N,N'-alkylidene-*bis*(ethylenically unsaturated amide), 1,3,5-Triacryloylhexahydro-1,3,5-triazine, and combinations comprising at least one of the foregoing crosslinking agents.

22. The polymer matrix material as in claim 1, wherein the crosslinking agent comprises about 0.01% to about 15%, by weight, of the total monomer solution prior to polymerization.

23. The polymer matrix material as in claim 1, wherein the crosslinking agent comprises about 0.5% to about 5%, by weight, of the total monomer solution prior to polymerization.

24. The polymer matrix material as in claim 1, wherein the crosslinking agent comprises about 1% to about 3%, by weight, of the total monomer solution prior to polymerization.

25. The polymer matrix material as in claim 6, wherein the desired species comprises an alkaline solution.

26. The polymer matrix material as in claim 25, wherein the alkaline solution comprises KOH.

27. The polymer matrix material as in claim 26, wherein the conductivity is greater than about 0.1 Siemens per centimeter.

28. The polymer matrix material as in claim 26, wherein the conductivity is greater than about 0.2 Siemens per centimeter.

29. The polymer matrix material as in claim 26, wherein the conductivity is greater than about 0.4 Siemens per centimeter.

30. The polymer matrix material as in claim 2, wherein the water-soluble or water-swellable polymer is selected from the group consisting of polysulfone (anionic), poly(sodium-4-styrenesulfonate), carboxymethyl cellulose, polysulfone (anionic), sodium salt of poly(styrenesulfonic acid-co-maleic acid), corn starch, any other water-soluble or water-swellable polymers, and combinations comprising at least one of the foregoing polymers.

31. The polymer matrix material as in claim 2, wherein the water-soluble or water-swellable polymer comprises less than about 30%, by weight, of the polymer matrix material.

32. The polymer matrix material as in claim 2, wherein the water-soluble or water-swellable polymer comprises about 1% to about 10%, by weight, of the polymer matrix

material.

33. The polymer matrix material as in claim 2, wherein the water-soluble or water-swellable polymer comprises about 1% to about 4%, by weight, of the polymer matrix material.

34. The polymer matrix material as in claim 4, wherein the water-soluble or water-swellable polymer is selected from the group consisting of polysulfone (anionic), poly(sodium-4-styrenesulfonate), carboxymethyl cellulose, polysulfone (anionic), sodium salt of poly(styrenesulfonic acid-co-maleic acid), corn starch, any other water-soluble or water-swellable polymers, and combinations comprising at least one of the foregoing polymers.

35. The polymer matrix material as in claim 4, wherein the water-soluble or water-swellable polymer comprises less than about 30%, by weight, of the polymer matrix material.

36. The polymer matrix material as in claim 4, wherein the water-soluble or water-swellable polymer comprises about 1% to about 10%, by weight, of the polymer matrix material.

37. The polymer matrix material as in claim 4, wherein the water-soluble or water-swellable polymer comprises about 1% to about 4%, by weight, of the polymer matrix material.

38. The polymer matrix material as in claim 3, wherein the chemical polymerization

initiator is selected from the group consisting of ammonium persulfate, alkali metal persulfates and peroxides, and combinations comprising at least one of the foregoing initiators.

39. The polymer matrix material as in claim 3, wherein the chemical polymerization initiator comprises less than about 3%, by weight, of the polymer matrix material.

40. The polymer matrix material as in claim 4, wherein the chemical polymerization initiator is selected from the group consisting of ammonium persulfate, alkali metal persulfates and peroxides, and combinations comprising at least one of the foregoing initiators.

41. The polymer matrix material as in claim 4, wherein the chemical polymerization initiator comprises less than about 3%, by weight, of the polymer matrix material.

42. A method of making a polymer matrix material comprising:

polymerization an aqueous solution of one or more monomers selected from the group of water-soluble, ethylenically-unsaturated acids and acid derivatives and a crosslinking agent, wherein a quantity of water is selected to swell the polymer matrix material to a defined volume upon curing.

43. The method as in claim 42, wherein the polymerization is carried out at a temperature ranging from room temperature to about 130° C.

44. The method as in claim 42, wherein the polymerization is carried out at a temperature ranging from about 75° to about 100° C.

45. The method as in claim 42, wherein the polymerization is carried out using radiation in conjunction with heating.

46. The method as in claim 42, wherein the polymerization is carried out using radiation.

47. The method as in claim 46, wherein the radiation source is selected fro the group consisting of ultraviolet light, gamma rays, x-rays, electron beam, and a combination of at least one of the foregoing radiation sources.

48. The method as in claim 46, wherein the aqueous solution further comprises a chemical polymerization initiator.

49. The method as in claim 42, further comprising replacing the water with a desired species.

50. The method as in claim 49, wherein the quantity and concentration of the desired species is selected such that the volume of the polymer matrix material after species replacement deviates from the volume of the polymer matrix material before species replacement by less than about 50%.

51. The method as in claim 49, wherein the quantity and concentration of the desired species is selected such that the volume of the polymer matrix material after species replacement deviates from the volume of the polymer matrix material before species replacement by less than about 20%.

52. The method as in claim 49, wherein the quantity and concentration of the desired species is selected such that the volume of the polymer matrix material after species replacement deviates from the volume of the polymer matrix material before species replacement by less than about 5%.